Al-Dhahir 2

assuming the amendments made in the amendment filed march 4, 2004
was **not** entered because of poor fax quality

1. **(Currently Amended)** A receiver operating in an environment where a transmission channel, **H**, between a transmitter of information and said receiver has a memory corresponding to n transmitted symbols, said receiver being responsive to an n_o plurality of receiving antennas comprising:

a pre-filter having an $n_o \times n_i$ plurality of FIR filters, F(j,k), where n_i is a number of transmitting antennas whose signals said receiver is processing, j is an index running from 1 to n_o and k is an index running from 1 to n_i, each filter F(j,k) being responsive to a signal that is derived from ~~one of said no antennas~~ receiving antenna j, and applying its output signal to a pre-filter output point k ~~applied to an input point, and each developing an output signal that contributes to one of ni pre-filter outputs~~; and

decision logic responsive to said [[n_i]] pre-filter output points.

2. **(Currently Amended)** The receiver of claim **1** further comprising a sampling circuit interposed between said n_o plurality of antennas and said pre-filter that samples received signal at rate $T_s = \dfrac{T}{l}$, where l is an integer that is greater than 1, and T is symbol rate of a transmitter whose signals said receiver receives.

3. **(Currently Amended)** The receiver of claim [[2 where $l>1$]] 1 further comprising a preprocessor for computing coefficients of said FIR filters that result in an

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effective transmission channel memory between said transmitter and output of said pre-filter of N_b transmitted symbols that is less than n.

4. (Currently Amended) The receiver of claim [[1]] 2 further comprising a preprocessor for computing where coefficients of said FIR filters are computed in a processor in response to a block of N_f symbols that is received by said receiver, and installing the computed coefficients in said FIR filters.

5. (Delete) .

6. (Currently Amended) The receiver of claim 4 where said coefficients of said FIR filters are computed and installed once every time interval during which transfer characteristics of said transmission channel, H, exhibits a significant change are substantially constant.

7. (Delete) .

8. (Delete) .

9. (Delete) .

10. (Delete) .

11. (Currently Amended) The receiver of claim [[10]] 1 wherein said decision logic is adapted to receive from said transmitting antennas transmitted signals that were encoded in a space-time encoding schema.

12. (Original) The receiver of claim **2** where said plurality of FIR filters is expressed by matrix **W**, and **W** is computed by $\mathbf{W}_{opt}^{*} = \tilde{\mathbf{B}}_{opt}^{*} \mathbf{R}_{xy} \mathbf{R}_{yy}^{-1}$,

$\mathbf{W}_{opt}^{*} = \tilde{\mathbf{B}}_{opt}^{*} \mathbf{R}_{xx} \mathbf{H}^{*} (\mathbf{HR}_{xx} \mathbf{H}^{*} + \mathbf{R}_{nn})^{-1}$, or $\mathbf{W}_{opt}^{*} = \tilde{\mathbf{B}}_{opt}^{*} (\mathbf{R}_{xx}^{-1} + \mathbf{H}^{*} \mathbf{R}_{nn}^{-1} H)^{-1} \mathbf{H}^{*} \mathbf{R}_{nn}^{-1}$, where $\mathbf{R}_{xx}$ is an autocorrelation matrix of a block of signals transmitted by a plurality of transmitting antennas to said n_o antennas via a channel having a transfer characteristic **H**, $\mathbf{R}_{nn}$ is an autocorrelation matrix of noise received by said plurality of n_o antennas during said block of signals transmitted by said transmitting antennas, $\mathbf{R}_{xy} = \mathbf{R}_{xx} \mathbf{H}^{*}$, $\mathbf{R}_{yy} = \mathbf{HR}_{xx} \mathbf{H}^{*} + \mathbf{R}_{nn}$, and $\tilde{\mathbf{B}}_{opt}^{*}$ is a sub-matrix of matrix $\mathbf{B}_{opt}^{*}$, where $\mathbf{B}_{opt} = \arg\min_{B} trace(\mathbf{R}_{ee})$ subject to a selected constraint, $\mathbf{R}_{ee}$ being the error autocorrelation function.

13. (Original) The receiver of claim **12** wherein said plurality of FIR filters are subjected to designer constraints relative to any one or a number of members of the following set: transmission channel memory, size of said block, effective memory of the combination consisting of said transmission channel and said pre-filter; n_i, n_o, autocorrelation matrix $\mathbf{R}_{xx}$, autocorrelation matrix $\mathbf{R}_{nn}$, value of factor l in said sampling circuit, and decision delay.

14. (Currently Amended) The receiver <u>of claim 12,</u> where said matrix $\mathbf{W}$ is expressible by $\mathbf{W} \equiv \begin{bmatrix} \mathbf{W}_0 & \mathbf{W}_1 & \cdots & \mathbf{W}_{N_f-1} \end{bmatrix}'$, where matrix $\mathbf{W}_q$ <u>, q being an index between 0 and $\mathbf{N}_{f-1}$,</u> is a matrix that specifies q^{th} tap coefficients of said FIR filters.

15. (Original) The receiver of claim **12** where said constraint restricts $\mathbf{B}$ so that $\mathbf{B}^*\mathbf{\Phi} = \mathbf{I}_{n_i}$, where $\mathbf{\Phi}^* \equiv \begin{bmatrix} \mathbf{0}_{n_i \times n_i m} & \mathbf{I}_{n_i} & \mathbf{0}_{n_i \times n_i (N_b-m)} \end{bmatrix}$ and m is a selected constant.

16. (Original) The receiver of claim **15** where $\mathbf{B} = \bar{\mathbf{R}}^{-1}\mathbf{\Phi}(\mathbf{\Phi}^*\bar{\mathbf{R}}^{-1}\mathbf{\Phi})^{-1}$, $\bar{\mathbf{R}}$ is a sub-matrix of a matrix $\mathbf{R}^\perp = \mathbf{R}_{xx} - \mathbf{R}_{xy}\mathbf{R}_{yy}^{-1}\mathbf{R}_{yx}$.

17. (Original) The receiver of claim **12** where said constraint restrict $\mathbf{B}$ so that $\mathbf{B}^*\mathbf{B} = \mathbf{I}_{n_i}$.

18. (Original) The receiver of claim **17** where $\mathbf{B} = \mathbf{U}\begin{bmatrix} e_{n_i N_b} & \cdots & e_{n_i (N_b+1)-1} \end{bmatrix}$, each element e_p is a vector having a 0 element in all rows other than row p, at which row the element is 1, and U is a matrix that satisfies the equation $\bar{\mathbf{R}} \equiv \mathbf{U\Sigma U}^*$, $\mathbf{\Sigma}$ being a diagonal matrix.